

REMARKS

Applicants have amended claims 11, 13, 15 and 19-24, and have canceled claims 1-18, 25 and 26 during prosecution of this patent application. Applicants are not conceding in this patent application that said amended and canceled claims are not patentable over the art cited by the Examiner, since the claim amendments and cancellations are only for facilitating expeditious prosecution of this patent application. Applicants respectfully reserve the right to pursue said amended and canceled claims, and other claims, in one or more continuations and/or divisional patent applications.

Applicants have amended the specification to correct a typographical error. No new matter has been added.

Support for Applicants amendment to claim 22 is found in Applicants FIG. 5B, and discussion and drawing *infra* with respect to the Examiners 35 U.S.C. 112 rejection. No new matter has been added.

Applicants respectfully inform the Examiner, that Species I reads on Applicants FIGs, 1, 2, 3, 5A, 5B and 7 and Species II reads on Applicants FIGs, 1, 2, 3,6 and 7

Applicants respectfully inform the Examiner that FIG. 1 supports claim 22 (a); FIG, 2 supports claim 22 (b); FIG. 3 supports claims 22 (c) and 27; FIG. 5A supports claim 22 (d) (i) and (iii); FIG. 5B supports claim 22 (d) (iii); and FIG. 7 supports claim 22 (d) (iv), and 22 (e).

The Examiner rejected claims 19-24 and 27-30 under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement.

The Examiner rejected claims 19, 21-24, 27, 29 and 30 under 35 U.S.C. § 102(b) as allegedly being anticipated by Karlsson et al. (US Pat. 6,124,183, hereinafter Karlsson).

The Examiner rejected claims 20 and 28 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Karlsson (US Pat. 6,124,183).

Applicants respectfully traverse the § 112, § 102(b) and §103(a) rejections with the following arguments.

EXAMINER INTERVIEW SUMMARY

On Feb. 5, 2009 an interview was held between Examiner David Vu and Applicants representative Anthony M. Palagonia. The election requirement of July 10, 2008 and applicants response of Aug. 5, 2008 where discussed. Applicants respectfully pointed out that an error had been made in their election response. Species I, FIGs. 5A and 5B were to claims 19-21, 23, 24 and 27-30 and species II, FIG. 6 was to claims 11, 13, 15-18, 25 and 26. In the election response Applicants mistakenly identified claims 19-21, 23, 24 and 27-30 as belonging to Species II FIG. 6. The Examiner has examined claims 19-21, 23, 24 and 27-30. Claims 19-21, 23, 24 and 27-30 do read on FIGs. 5A and 5B. The Examiner has agreed to allow Applicants to correct the species election to Species I, FIGs. 5A and 5B, claims 19-21, 23, 24 and 27-30 without traverse.

Applicants believe the issues raised by the Examiner under Election/Restriction in the present Office communication have been resolved by this interview.

35 U.S.C. § 112, First Paragraph

The Examiner rejected claims 19-24 and 27-30 under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement.

The Examiner stated, "Claims 19-24 and 27-30 are rejected, under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The original disclosure does not include teaching "after said removing of said layer of said layer of said fill material, said fill layer of material thicker over said planarization stop layer between adjacent trenches of said first set of trenches then over said fill material contained within each trench of said first set of trenches" (see claim 22, step (d), (iii))."

In response applicants have amended claim 22 to more clearly describe the feature claimed. Claim 22 now reads "measured from a plane coplanar with said top surface of said planarization stop layer and in a direction away from said substrate after said removing of said layer of said layer of said fill material, a remaining layer of said fill material thicker over said planarization stop layer between adjacent trenches of said first set of trenches than over each trench of said first set of trenches."

Applicants respectfully point to FIG. 5B where of regions 155A of fill material 150 over the top surface of planarization stop layer 120 between trenches 135 is thicker than fill material 150 between regions 155A measured from a plane coplanar with the top surface of planarization stop layer 120. The figure below is modified version of FIG. 5B. It has been modified only to the extent necessary to show the plane coplanar with the top surface of planarization stop layer

120 in the heavy line marked "Plane" and certain reference numerals. In this modified drawing it is clear that because of regions 155A over planarization stop layer 120, the fill material (labeled A) between two adjacent trenches 135 is thicker over the plane than the fill material (labeled B) over two adjacent trenches 135.

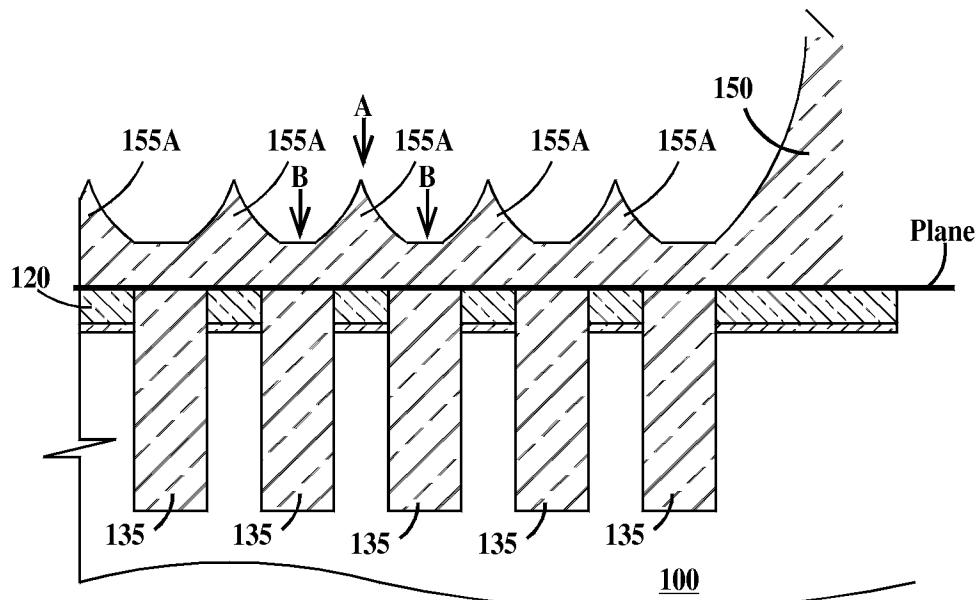


FIG. 5B

35 U.S.C. § 102(b): Claims 19, 21-24, 27, 29 and 30

The Examiner rejected claims 19, 21-24, 27, 29 and 30 under 35 U.S.C. § 102(b) as allegedly being anticipated by Karlsson et al. (US Pat. 6,124,183, hereinafter Karlsson).

The Examiner stated Karlsson teaches, “(b) forming a first set of trenches 205 in a first region of planarization stop layer 203 and substrate 201 and forming a second set of trenches 206 in a second region of planarization stop layer 203 and substrate 201, trenches in first set of trenches 205 having a higher aspect ratio than trenches 206 in second region (fig. 2E).”

The Examiner further stated Karlsson teaches, “(iii) removing a layer of fill material 208 exposed in opening, fill material 208 still completely filling each trench of first set of trenches, after removing a layer of fill material 208, fill layer of material 208 thicker over planarization stop layer 203 (t3) between adjacent trenches of first set of trenches 205 than over fill material contained within each trench of said first set of trenches (208 material inside trench 205; t4) (col. 5, line 54-60 and fig. 2I).”

Applicants respectfully contend that Karlsson does not anticipate claim 22, as amended, because Karlsson does not teach each and every feature of claim 22.

In a first example, Karlsson does not teach “said first set of trenches having at least two more adjacent trenches.”

Applicants respectfully point out that in all FIGs. of Karlsson there are no first trenches 205 adjacent to each other, there is always a second trench 206 intervening between first trenches 205.

In a second example, Karlsson does not teach.” measured from a plane coplanar with said top surface of said planarization stop layer and in a direction away from said substrate after said removing of said layer of said layer of said fill material, a remaining layer of said fill material

thicker over said planarization stop layer between adjacent trenches of said first set of trenches than over each trench of said first set of trenches.” See Applicants FIG. 5B, and discussion and drawing *supra* with respect to the Examiners 35 U.S.C. 112 rejection.

(1) Applicants respectfully point out that since there are no adjacent first trenches 205 taught by Karlsson, it is not possible for Karlsson to teach “a remaining layer of said fill material thicker over said planarization stop layer between **adjacent** trenches of said first set of trenches than over each trench of said first set of trenches” as Applicants claim 22 requires.

(2) Applicants respectfully point out that in Karlsson FIG. 2I after etching fill material 208 over layer 203 is the **same** as over trench 205 when measured from a plane drawn coplanar with the top surface of layer 203. Applicants respectfully point out that trench 206 is a trench of the Karlssons set of second trenches. Applicants claim 22 requires “a remaining layer of said fill material **thicker** over said planarization stop layer between adjacent trenches of said first set of trenches than over each trench of said first set of trenches.” Note, the thickness of fill 208 under photoresist layer 211 is excluded because it is not between adjacent first trenches 205.

Based on the preceding arguments, Applicants respectfully maintain that Karlsson does not anticipate claim 22, and that claim 22 is in condition for allowance. Since claims 19, 21-24, 27, 29 and 30 depend from claim 22, Applicants respectfully contend that claims 19, 21-24, 27, 29 and 30 are likewise in condition for allowance.

As to claim 19, the Examiner stated, “at some point during the removing process, $t_1 = t_2$ (when the layer 208 having a substantially planar upper surface).

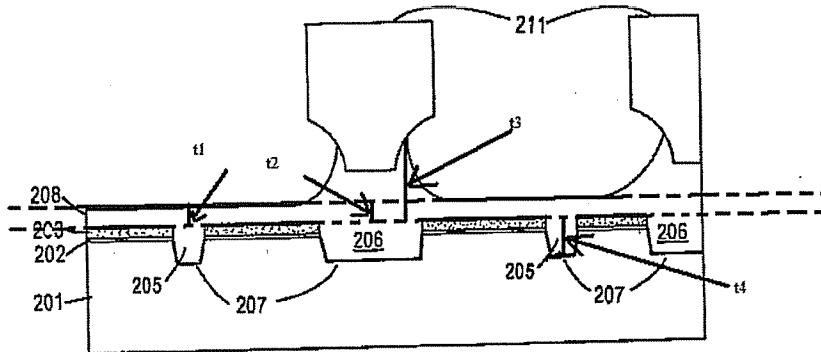


Figure 2I

Applicants claim 19 requires “wherein after (d) and before (e), a first volume of fill material in said first region not completely contained in said trenches of said first set of trenches is about equal to a second volume of fill material in said second region not completely contained in said trenches of said second set of trenches.”

Since only two dimensions are shown in Karlsson FIG. 2I, it is not possible to determine any teaching related to volumes. This would have to come from the specification Karlsson. There is not teaching of volume in the specification of Karlsson.

Based on the preceding arguments, Applicants respectfully maintain that Karlsson does not anticipate claim 19, and that claim 19 is in condition for allowance.

As to claim 21, the Examiner did not cite and specific teaching of Karlsson. Applicants claim 21, requires “wherein (d) reduces the difference between a volume of said fill material over first region and a volume of said fill material over said second region.”

Since only two dimensions are shown in Karlsson FIG. 2I, it is not possible to determine any teaching related to volumes. This would have to come from the specification Karlsson. There is not teaching of volume in the specification of Karlsson.

Based on the preceding arguments, Applicants respectfully maintain that Karlsson does not anticipate claim 21, and that claim 21 is in condition for allowance.

As to claim 29, the Examiner did not cite and specific teaching of Karlsson. Applicants claim 29, requires, “wherein said first region is a memory cell array region and said second region is a support circuit region of an integrated circuit.”

Applicants not find any teaching in Karlsson of “said first region is a memory cell array region and said second region is a support circuit region of an integrated circuit” as Applicants claim 29 requires.

Based on the preceding arguments, Applicants respectfully maintain that Karlsson does not anticipate claim 29, and that claim 29 is in condition for allowance.

35 U.S.C. § 103(a): Claims 20 and 28

The Examiner rejected claims 20 and 28 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Karlsson (US Pat. 6,124,183).

As to claims 20 and 28, Applicants have argued *supra* in response to the Examiners § 102(b) rejection of claim 22 that claim 22 is allowable, since claims 20 and 28 depends from claim 22, Applicants respectfully maintain that claim claims 20 and 28 are not unpatentable over Karlsson and are in condition for allowance.

As to claims 15 and 20, Applicants respectfully contend that claims 15 and 20 is not obvious in view of Karlsson because Karlsson does not teach or suggest every feature of claims 15 and 20. For example, Karlsson does not teach or suggest, “wherein (d) removes about 5 to 20% of an as deposited thickness of said fill material.”

As to claim 20, the Examiner stated, “Karlsson fails to disclose the fill material is removed about 5 to 20% of the as deposited thickness (claim 20); and the aspect ratio of the first/second trenches (claim 28). It would have been obvious to one with ordinary skill in the art at the time of the invention to perform an etched back process step as taught by Karlsson. The amount of the fill material being etched and the aspect ratio of the first/second trenches does not define patentable over Karlsson since it is well known processing variable and the discovery of the optimum or workable range involves only routine skill in the art. The specific amount of the semiconductor being etched does not provide any critical or unexpected results to the method of manufacturing a semiconductor device. Rather, it is merely an obvious selection of the etching amount based on desired functional characteristics determinable by

routine experimentation. *In re Aller*, the court stated, "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456 105 USPQ 233,235 (CCPA 1995)."

As to claim 20:

Applicants claim 20 requires wherein (d) removes about 5 to 20% of the as deposited thickness of said fill material." Applicants note that

Applicants respectfully point out that Karlsson is silent as to aspect ratio of the trenches, and therefore cannot be the basis of 103 rejection because "the general conditions of a claim" are not "disclosed in the prior art" as required by *In re Aller*.

As to claim 28:

Applicants claim 28 requires "wherein the aspect ratio of trenches in said first set of trenches is greater than about 3:1 and the aspect ratio of trenches in said second region is less than about 3:1."

Applicants respectfully point out that in col. 5, lines 57-59, Karlsson teaches "the insulating material 208 is isotropically etched, as shown in FIG. 2I to remove **most** of the insulating material 208 over polish stop layer 302 and the small trenches." Applicants respectfully contend that one of ordinary skill in the art would interpret "most" as being greater than 50% which is 10 to 2.5 times as much as Applicants claim. Thus Karlsson is teaching away from Applicants specific range. Applicants respectfully contend it is unexpected that so little removal of fill material results in a significant increase in uniformity since Karlsson had to remove most of his fill material.

Based on the preceding arguments, Applicants respectfully maintain that claims 20 and 28 are not unpatentable over Karlsson and are in condition for allowance.

CONCLUSION

Based on the preceding arguments, Applicants respectfully believe that all pending claims and the entire application meet the acceptance criteria for allowance and therefore request favorable action. If Examiner believes that anything further would be helpful to place the application in better condition for allowance, Applicants invite the Examiner to contact the Applicants' representative at the telephone number listed below. The Director is hereby authorized to charge and/or credit Deposit Account 09-0458 (IBM).

Respectfully submitted,
FOR: Economikos et al.

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